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Title Page
Master of Public Health Research Project

Knowledge and perceived ambiguity of physical activity recommendations and physical activity in men and women in the United States.

by

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Abstract

Background: The majority of Americans – especially women – do not meet physical activity recommendations. Having physical activity goals has been associated with physical activity participation, and physical activity recommendations set by public health experts can be viewed as externally set goals. However, past research has shown that goals that are specific rather than ambiguous are more likely to be achieved, and variations in recommendations over time and across sources may have created perceived goal ambiguity.

Objectives: This study aimed to (1) examine the extent of physical activity recommendation knowledge among adults in the United States, (2) quantify perceptions of the ambiguity of these recommendations, (3) determine whether knowledge of physical activity recommendations is associated with physical activity level, and (4) investigate whether perceived ambiguity of recommendations moderates the relationship between recommendation knowledge and activity. An additional objective was to explore demographic differences in any associations detected.

Methods: SUDAAN was used to weight data from the 2005 Health Information National Trends Survey (HINTS) (N=5,586) to represent the U.S. population. Descriptive statistics were calculated, and logistic regression was used to determine crude and adjusted odds ratios.

Results: An estimated 31% of Americans had accurate knowledge of recommendations, and 35% reported engaging in physical activity at the recommended level. An estimated 75% perceived the recommendations as ambiguous. The odds of reporting accurate knowledge of recommendations were significantly higher among women than among men (OR 1.53, 95% CI 1.22-1.93), but accurate knowledge of recommendations was associated with physical activity at the recommended level only among men (OR 1.67, 95% CI 1.06-2.64). Perceived ambiguity did not moderate the association between knowledge and activity level in any analysis.

Conclusions: These findings support disseminating updated physical activity recommendations as indicated by the scientific evidence base. Future research should explore: (1) how to boost knowledge of recommendations, particularly in men, (2) factors that would enable women to act on such knowledge, and (3) gender differences in other determinants of physical activity.

Introduction & Background

The importance of being physically active for health is well documented in published research. Regular physical activity reduces the risk of premature mortality and lowers risks for developing chronic diseases such as heart disease, diabetes, hypertension, and most types of cancer.[1,2] Participation in regular physical activity builds and maintains healthy muscles, bones and joints, thus improving mobility and strength throughout the lifespan. Physical activity also provides psychological benefits, such as reducing feelings of depression and anxiety while improving mood and a sense of well-being.[1] In addition, being active is the most effective means of maintaining normal weight and preventing obesity which is at epidemic proportions in the U.S. today.[3]

Many professional organizations have issued recommendations concerning the frequency, duration, intensity and type of physical activity needed to experience optimal health benefits. These guidelines have evolved as scientific understanding has progressed. In the 1960s and 1970s, cardiorespiratory fitness and improved physical performance capacity were the foci for the American College of Sports Medicine (ACSM), the American Heart Association (AHA) and other prominent groups. A position statement by ACSM in 1978 recommended 15 to 60 minute sessions of aerobic exercise at an intensity of 60 to 90 percent of maximal heart rate using large muscle groups, 3 to 5 days per week. Suitable exercises included jogging, swimming, bicycling and similar activities. This served as the basis for most exercise recommendations for public health promotion through 1990.[1]

In 1990, the ACSM updated its position to acknowledge mounting evidence of health benefits from more moderate forms of activity. The revised recommendation suggested moderate-intensity resistance training at least twice per week and increased the minimum

recommended duration of aerobic exercise sessions to 20 minutes.[4] It has been reported that other groups' recommendations were generally based on the same data as ACSM's and therefore were similar.[1]

Research continued to uncover health benefits associated with moderate levels of activity intensity as well as dose-response relationships between physical activity and health outcomes. As a result, in 1995 the Centers for Disease Control and Prevention (CDC) and ACSM jointly issued new, detailed recommendations. Various kinds of physical activity were categorized as low, moderate or vigorous intensity based on heart rate and estimated energy expenditure. The main recommendation was for adults to perform 30 or more minutes of moderate-intensity physical activity, in one session or in multiple bouts of 8 to10 minutes at a time, 5 to 7 days per week. They also noted that greater health benefits may be achieved by increasing the duration or intensity of those activities. If vigorous activities are regularly performed, the older recommendation was still applicable: at least 20 minutes on 3 or more days per week. Additional guidelines were provided for special populations such as young people, older adults and those with specific health conditions. These new guidelines were emphasized by the U.S. Surgeon General, the National Institutes of Health and the AHA in 1996.[5] They served as a basis for the physical activity targets[6] in Healthy People 2000 and 2010 and are still used by the CDC and ACSM, along with tailored recommendations for particular groups.

Although changes in recommendations have occurred gradually over time, it is possible that the variations in the messages made them less clear to the public. Also potentially confusing the matter, physical activity recommendations that are more demanding than the 1995 CDC/ACSM recommendations were issued by the Institute of Medicine in 2002 (these recommendations have not been widely adopted) and with recent dietary recommendations.

Furthermore, messages about preventive health behaviors such as physical activity may vary to an even greater extent in the mass media. The mass media has been described as contributing to a paradigm of medical uncertainty in modern society.[7]

A perceived lack of recommendation clarity may be one contributing factor in the widespread failure to meet the physical activity recommendations. More than half of Americans adults do not meet 1995 CDC/ACSM recommendations[8] and only one-third of adults engage in regular leisure-time activity.[9] Approximately 14% of American adults are physically inactive, failing to engage in activity of just 10 minutes per week of moderate or vigorous intensity.[8]

Physical activity levels also vary among demographic groups. CDC[10] reports that 28% of women report no leisure-time physical activity compared with 24% of men. Likewise, fewer women (47%) than men (50%) meet physical activity recommendations. African Americans, particularly women, have lower rates of physical activity than Caucasians.[11] When statistical adjustments are made for age differences, it is estimated that half of poor and near-poor adults are inactive.[9]

Interest in understanding and promoting physical activity is growing. Theories of behavior change have begun to be applied to physical activity, and several related individual, social and environmental factors have been found to be associated with physical activity.[1] Goal-setting is one such factor. For example, targets for the number of steps to be walked per day may be associated with increases in physical activity.[12] Public health recommendations about specific levels of physical activity can be viewed as goals. However, public health recommendations have not been studied in the context of goal-setting theory, despite a call for more research to examine recommendations from health experts as goals.[13] To respond to this call, goal-setting theory will be used to frame the present study.

Goal-setting theory arose within industrial-organizational psychology and has since been applied to health behavior change, including physical activity.[13] Goal-setting theory defines a goal as "that which one wants to accomplish; it concerns a valued, future end state."[14] Theorists coming from this perspective point out that goals can vary by degree of difficulty, specificity and complexity. They do not employ terminology in common usage in public health wherein a 'goal' is broad and unquantified and the term 'objective' is used for specific, measurable, time-framed aims. In this paper, 'goal' will be used in both the general and specific cases, as it is in goal-setting theory.

Goals are thought to improve performance by motivating effort, persistence and concentration.[13,15] Although setting goals does not guarantee the necessary motivation or readiness for their achievement, goal-setting theory asserts that motivation is affected in those who are primed. For example, the performance of those termed "precontemplators" in the transtheoretical model should be less affected by externally set goals than "contemplators" would be.

Goals can be externally assigned, self-set by individuals, or arrived at through mutual participation between an external source and an individual. It has been suggested that self-set goals may result in poorer outcomes if they are off-base (either too easy or too difficult), and they are not tailored to address potential obstacles to adherence individuals could face. However, externally goals set by public health experts may offer the advantages of: (1) evidence-based consideration of beneficial levels of action, and (2) high credibility among consumers. While existing research in this area is limited, one study found that self-set behavior change goals did not result in greater behavior change than externally set goals.[16]

In this study, the 1995 CDC/ASCM recommendations for physical activity will be studied as externally set goals. These recommendations were selected because CDC and the ACSM have not issued new recommendations, and they are the basis for the Healthy People 2010 objectives.

Goal-setting theory posits that setting specific goals leads to higher levels of performance than having no goals or vague ones; this relationship has substantial empirical support.[13] Specificity of goals has been found to be important for reducing variation in performance[17] by reducing ambiguity about what is to be attained.[18] It is possible that the variations in physical activity recommendations over time and across sources have created ambiguity in the public understanding of the current recommendations. According to goal-setting theory, ambiguity would make performance less successful. A literature review conducted for this studied did not identify any studies that examined perceived ambiguity of physical activity recommendations.

Consistent with the health belief model, there have been a few studies on knowledge of recommendations, knowledge of the risks of physical inactivity, and physical activity participation.[19] Of note here is one study conducted in 1997; it examined knowledge of the 1995 recommendations and related behavior and found that the 1995 recommendations were not widely known among American adults.[20] Most subjects were aware of the general health benefits from traditional exercises (e.g., biking, jogging, swimming) emphasized in earlier recommendations. Knowledge of the 1995 recommendations was not found to differ between those who met them and those who did not. The authors speculated that those who met the 1995 recommendations may have been following previous guidelines which, although out-of-date, fell within the wider possibilities offered in the 1995 standards. Survey respondents may not have known about the then-new recommendations because they had been publicized for a relatively

short time. The authors suggested that if more Americans clearly knew the 1995 recommendations (which added flexibility in terms of moderately strenuous activity), then they might be more likely to meet them. It is also possible that the change in recommendations may have created perceived ambiguity and thus decreased goal specificity and associated performance levels among those who were aware of the update.

In order to inform health communication efforts, it is necessary to assess the accuracy and clarity of Americans' knowledge of physical activity recommendations that can be viewed as current, and the degree to which knowledge and perceived clarity affect compliance. More than 10 years have passed since the 1995 recommendations were issued; ample time has elapsed for the dissemination of this message throughout the American public. In addition, these recommendations are still endorsed by the CDC and the ACSM, and they apply to the major portion of the U.S. population. It is important to evaluate the extent of dissemination of these recommendations and to assess the degree and effects of ambiguity that may have resulted from the proliferation of differing recommendations over time.

Therefore, the purposes of the present study are to:

(1) To assess knowledge of the 1995 physical activity recommendation from CDC/ACSM

(2) To quantify perceptions of the ambiguity of this recommendation

(3) To test the hypothesis that knowledge of the recommendation is associated with recommended behavior

(4) To test the hypothesis that perceived recommendation ambiguity will moderate any knowledge-behavior relationship

(5) To examine demographic differences in any associations detected.

Methods

Data source

Data for the study were obtained from the 2005 Health Information National Trends Survey (HINTS). Details of this survey are available elsewhere.[21,22] Briefly, HINTS is a national random-digit dial (RDD) survey of American adults, conducted by the National Cancer Institute to monitor the public health information environment and inform health communication activities. The survey was first administered from 2002-2003 and is scheduled to be conducted every 2 years. In 2005, after RDD was used for sample selection, surveys were administered over the phone or Internet, to test for certain differences between formats. Overall, the two methods produced comparable results.[22] African Americans and Hispanics were oversampled. The response rate for the household screener was 34.01%; of those screened into the study, the response rate for the extended interview was 61.25%. The final dataset included 5,586 respondents.

Definitions and measures

Physical activity level. Two survey items were recoded such that respondents who reported both (1) engaging in physical activity of at least moderate intensity for at least 30 minutes, and (2) exercising on 5 or more days of the week were classified as meeting the 1995 CDC/ACSM recommended physical activity level. Those who reported less physical activity (for total daily duration or days per week or both) were grouped as not meeting the recommended level.

Knowledge of physical activity recommendations. Similarly, a knowledge variable was constructed by recoding responses that the recommended amount of physical activity was at least 30 total minutes per day and that one should engage in physical activity at least 5 days per week

to equal accurate recommendation knowledge. Those who provided any other responses were classified as not having accurate knowledge.

Perceived ambiguity of recommendations. Perceived ambiguity of recommendations was measured by the following item: "How much do you agree or disagree with the following statement? There are so many different recommendations about physical activity or exercise that it's hard to know which ones to follow."[21] It was scored by a four-point Likert-type response scale; response options ranged from strongly disagree to strongly agree. For bivariate and multivariate analyses, this variable was dichotomized into the categories of *agree* (including responses of strongly or somewhat agreeing) and *disagree* (including responses of strongly or somewhat disagreeing).

As mentioned previously, physical activity levels have been found to vary by demographic group, with women,[10] African-Americans[11] and low-income adults[9] being less likely to meet recommendations. Therefore, the role of these demographic characteristics, as well as other characteristics that have been associated with health cognitions and preventive behaviors in previous research,[7] were included in the present study:

Gender. Respondents were categorized as either *male* or *female* based on their reported gender.

Race/ethnicity. Race and ethnicity were recoded into the following categories: *white, African-American, Hispanic,* and *other* (due to small sample sizes for other race/ethnicity groups).

Education. Education was recoded into a dichotomous variable. Respondents who reported completion of high school or vocational school, or any lower level of schooling, were classified as *high school or below*. Those who attended college without receiving a degree,

earned an associate's degree, or any higher level of education (including bachelor's and graduate degrees) were classified as *some college or above*.

Income. Reported annual income was categorized into four levels: *$25,000 or less, $25,001-$50,000, $50,001-$75,000* and *greater than $75,000*.

Age. Reported age was measured on a continuous scale. As per survey inclusion criteria, all respondents were at least 18 years of age.

For all variables, those who reported that they did not know or refused to respond were treated as missing.

See Table 1 for the specific wording of the survey items.

Statistical analyses

Statistical analyses were performed using SAS-callable SUDAAN version 9.0.1. SUDAAN was used to weight the analyses to account for the complex survey design and to generate estimates applicable to the adult U.S. population. Descriptive statistics calculated included frequencies and percentages for categorical variables, and the mean and standard deviation for the continuous variable, age.

Using logistic regression, crude and adjusted odds ratios were calculated in bivariate and multivariate analyses, respectively, to predict two outcomes: accurate recommendation knowledge and meeting the recommended physical activity level. In the multivariate analyses, logistic models were constructed to exclude variables with nonsignificant bivariate associations. An exception was the perceived ambiguity variable, which was included in all analyses because it was a main item of interest. In the multivariate model for recommended physical activity level, an *a priori* test of the interaction between knowledge and perceived ambiguity was

conducted. A significant interaction would have been interpreted to indicate effect moderation. All analyses were conducted for the total population, and were also stratified by gender post-hoc.

Results

Unweighted and weighted distributions are shown for demographic variables in Table 2 and for cognitive and behavioral variables in Table 3. For the unweighted sample, whites, females and those reporting some college or higher levels of education were in the majority. The mean age was 52. After weighting, the population proportions were similar to those found in the 2000 U.S. Census.[22] An estimated 75% of the population reported some level of perceived ambiguity of physical activity recommendations. Close to two-thirds failed to demonstrate accurate knowledge of recommendations and a similar proportion reported failing to meet the recommended level of physical activity.

Table 4 provides a summary of the results of the bivariate analyses for *accurate recommendation knowledge* for the total population and stratified by gender. A significant association was found between knowledge and gender; women had higher odds of accurate knowledge of recommendations compared to men (OR=1.48, 95% CI 1.22-1.79). Increases in age were also significantly associated with increased odds of accurate knowledge (OR=1.08, 95% CI 1.01-1.15). In women only, odds of having accurate knowledge were higher among those who did not perceive recommendations as ambiguous (OR=1.47, 95% CI 1.09, 1.98).

Table 5 shows the results of the multivariate analysis for *accurate recommendation knowledge*. Adjusting for age and perceived ambiguity, the odds of having accurate knowledge were still higher for women as compared to men (OR=1.57, 95% CI 1.26, 1.95). Perceived ambiguity remained significant for knowledge in women (OR=1.47, 95% CI 1.08, 2.01). Age was no longer significant for accurate knowledge in the adjusted analysis.

The results of the bivariate analyses for *physical activity level* are displayed in Table 6. Gender was significantly associated with physical activity level; for this outcome, men had higher odds of meeting the recommendation compared to women (OR=1.63, 95% CI 1.33-1.99). Hispanic men had lower odds of meeting the recommendation than other men (OR=.68, 95% CI .47-.98). Accurate knowledge of recommendations was significantly associated with the recommended behavior in the total population (OR=1.46, 95% CI 1.24-1.73), and for each stratum (males: OR= 1.63, 95% CI 1.29-2.05; females: OR=1.48, 95% CI 1.17-1.87). Perceived ambiguity was not significant for physical activity in any analysis.

Table 7 shows the results of the adjusted analysis for *physical activity level.* Gender remained significant, with the odds of meeting the recommended level of physical activity being 1.58 times higher for men than for women (95% CI 1.20-2.08). The odds ratio for Hispanic men was not significant in the adjusted analysis. Accurate knowledge of recommendations remained significant for recommended behavior in the total population (OR=1.43, 95% CI 1.13, 1.80) and in men (OR=1.58, 95% CI 1.09, 2.30), but was no longer significant in women. Neither perceived ambiguity nor the interaction term accurate knowledge x perceived ambiguity were significant in any analysis.

Discussion

This study had five purposes. The first was to assess knowledge of the central message of the 1995 CDC/ACSM physical activity recommendations. Accurate knowledge of the 1995 recommendations was reported by only about one-third of the population. Whether or not the effects of other demographic variables and perceived ambiguity were controlled, it was found that women had higher odds than men of knowing the recommendation.

The second purpose was to determine whether physical activity recommendations are perceived as ambiguous. Recommendations were largely perceived as ambiguous, with an estimated 75% of the population reporting some level of ambiguity.

Third, this study sought to test the hypothesis that knowledge of the physical activity recommendation is associated with recommended behavior. Based on goal-setting theory, it was hypothesized that accurate knowledge of the recommendation would be significantly associated with meeting that physical activity level. The results of both the bivariate and multivariate analyses supported this hypothesis, although the association did not hold for women in the stratified multivariate analysis.

The fourth purpose was to determine whether perceived ambiguity moderated the relationship between knowledge and behavior, as was hypothesized based on the tenet in goal-setting theory that ambiguity reduces specificity, and in turn, goal attainment. No such moderation was observed here. The lack of support for this aspect of goal-setting theory could have been due to the methodological limitations discussed below.

The final objective of this study was to examine demographic differences in any detected associations. Gender was found to play a significant role in both recommendation knowledge and physical activity level. Women were more likely to have accurate knowledge of the recommendations, while men were more likely to meet the recommendations. However, the association between recommendation knowledge and physical activity level in the multivariate analysis was found in the total population and for men, but not for women. It is possible that in the stratified analysis for women, there was insufficient power to detect an effect. It should be noted that if knowledge was significantly associated with physical activity for women, perceived ambiguity might play a role because it was associated with knowledge in women. Still, it

appeared that gender was more important than knowledge for predicting physical activity. Other barriers and facilitators of physical activity may be more important for women, such as juggling more demands, social factors, and the relative appeal of physical activity options.

White et al.[24] suggest that determinants of physical activity adherence in women differ from those for men. Additional research on such gender differences is needed. This reinforces calls in the literature[1,24] for a larger, orchestrated approach to understanding, increasing and maintaining physical activity. Many other theories and models, such as the transtheoretical model, the theory of planned behavior, learning theories, relapse prevention, and social and ecological approaches, are supported by research[1] and offer important explanatory constructs which complement those described here. For example, intentions in the theory of planned behavior may result from goal setting. Similarly, self-efficacy, the central and well-validated construct of social cognitive theory, has been associated with effort and persistence in goal-related tasks.[13]

This study had several limitations. Several pertained to its ability to test goal-setting theory with the data available. Ambiguity is a multi-dimensional construct with both cognitive and emotional components and was measured here by only a single item. Moreover, the item may not have captured ambiguity as the construct is used in goal-setting theory. While respondents may have agreed that there are so many recommendations that it is hard to know which to follow, they may have been responding in terms of generalities and not necessarily about themselves. It would be useful to establish the reliability and validity of an ambiguity measure through psychometric research. Additionally, those who responded to this question as undecided were treated as missing values, yet this response may reflect high ambiguity

perceptions. Finally, other aspects of the theory such as goal complexity and the roles of feedback and rewards were not taken into account here.

Because of the question wording in the survey, this study did not distinguish between multiple bouts of activity versus a single bout of activity to meet the 30-minute minimum duration in the 1995 CDC/ACSM recommendation. It also failed to determine whether respondents met the former minimum recommendations of vigorous exercise for 20 minutes on 3 days per week, which is an alternative to moderate-intensity activity for 30 minutes on 5 or more days per week in the recommendations.

There could be a question as to whether the 1995 CDC/ACSM guidelines should be considered current. The Department of Agriculture (USDA) and the Department of Health and Human Services (HHS) jointly issued new, more demanding physical activity recommendations in 2005 as part of their new dietary guidelines. As of the time of this study, the CDC and ACSM have not issued new recommendations, and the Healthy People 2010 objectives provide additional justification for using the 1995 recommendations. In addition, previous research[20] suggested a considerable time lag between when new recommendations are issued and when the public knows them.

Of course, the cross-sectional survey design does not permit causal inferences to be drawn and bias may have been introduced by using self-report data, despite attempts to minimize bias in the survey design and administration. Asking an open-ended question about annual income rather than using a question with income brackets may have increased reporting inaccuracies for this variable.

Despite these limitations, the results of this study add to the increasing body of literature on the application of goal-setting theory to health behavior change, and can inform

physical activity-related health communication and education. The findings suggest that externally set goals from public health authorities are associated with health behaviors, at least for physical activity. Furthermore, these findings indicate that updating recommendations, at least at current intervals, may add to perceived recommendation ambiguity but may not interfere with recommendation compliance.

A possible explanation for this might be found in the health belief model.[23] In this model, health behaviors depend on a person's perceptions of risks and benefits. Perceived risks and benefits have been linked with physical activity in some studies.[1] It is possible that more physical activity recommendations, even of varying content, increase perceived benefits of physical activity. A recent study on ambiguity aversion[7] suggested that perceived ambiguity about recommendations may not decrease the perceived overall value of recommended preventive behaviors. Updating recommendations also draws media attention, thereby increasing the frequency of cues to action, a central construct in the model.

The results of this study add to calls for health education initiatives to promote physical activity. Since knowledge of physical activity recommendations from professional organizations was found to be associated with behavior regardless of perceived recommendation ambiguity, these findings support updating such recommendations as indicated by the scientific evidence base. Knowledge is insufficient and, in some cases unnecessary, to explain participation in physical activity at recommended levels, but it does appear to be a contributing factor. Future research should explore: how to increase knowledge of recommendations, particularly in men; factors that would help women to act more readily on such knowledge; and gender differences in other determinants of physical activity.

Tables

Table 1. Wording of survey items.

Variable	Survey item(s)
Physical activity level	1. In a typical week, how many days do you do any moderate-intensity physical activity or exercise comparable to walking as if you were in a hurry? 2. On the days that you do any moderate physical activity or exercise, how long are you typically doing these activities?
Physical activity recommendation knowledge	1. How many days a week of physical activity or exercise are recommended for the average adult to stay healthy? 2. On those days, how long should the average adult be physically active to stay healthy?
Perceived ambiguity of recommendations	How much do you agree or disagree with the following statement: There are so many different recommendations about physical activity and exercise that it's hard to know which ones to follow. *Choices:* - Strongly agree - Somewhat agree - Somewhat disagree - Strongly disagree
Gender	Are you male or female?
Race/ethnicity	1. Which one or more of the following would you say is your race? *Choices:* - White - Black - Asian - American Indian or Alaskan Native - Native Hawaiian or other Pacific Islander 2. Are you Hispanic or Latino? *Choices:* - Yes - No
Education	What is the highest level of school you completed? *Choices:* - Never attended school or only attended nursery school/kindergarten - Grades 1 Through 5 (Elementary) - Grades 6 Through 8 (Middle) - Grades 9 Through 12 (Some High School But No Diploma) - High School Graduate (High School Diploma Or Equivalent, e.g., GED, Foreign Equivalent) - Vocational Or Trade School Graduate - Some College, But No Degree - Associate Degree In College - Bachelor's Degree - Master's Degree - Professional School Or Doctorate Degree (MD, DDS, JD, DVM, Ph.D., EdD, etc)
Income	What is your {combined} annual income, meaning the total pre-tax income from all sources earned in the past year?
Age	May I please have your age?

Table 2. Distribution of HINTS 2005 respondents: demographic variables.

Categorical variables	N	Unweighted %	Weighted %
Gender			
Male	1929	34.5	**48.1**
Female	3657	65.5	**51.9**
Race/ethnicity			
White	4165	77.8	**71.0**
African American	460	8.5	**10.6**
Hispanic	496	9.3	**12.9**
Other	234	4.4	**5.5**
Education			
Some college or above	3241	60.3	**55.6**
High school or below	2134	39.7	**44.4**
Income			
≤ $25,000	1005	26.6	**22.8**
$25,001 - $50,000	1158	30.7	**29.6**
$50,001 - $75,000	679	18.0	**20.1**
≥ $75,001	931	24.7	**27.5**

Continuous variable	Mean	SD
Age	52.2	17.9

Table 3. Distribution of HINTS 2005 respondents: cognitive and behavioral variables.

Categorical variables	N	Unweighted %	Weighted %
Cognitive:			
Perceived ambiguity			
Strongly agree	800	30.1	**30.9**
Somewhat agree	1127	42.3	**44.3**
Somewhat disagree	528	19.8	**18.4**
Somewhat disagree	207	7.8	**6.4**
Knowledge			
Accurate	1865	33.4	**31.3**
Not accurate	3721	66.6	**68.7**
Behavioral:			
Physical activity			
Recommended level or higher	1873	33.5	**35.1**
Below recommended level	3713	66.5	**64.9**

Table 4. Bivariate analyses for accurate knowledge of recommendations.

	TOTAL			MALES			FEMALES		
	OR	**95% CI**		**OR**	**95% CI**		**OR**	**95% CI**	
		Upper	*Lower*		*Upper*	*Lower*		*Upper*	*Lower*
Gender									
Male		referent			------			------	
Female	**1.48**	**1.22**	**1.79**		------			------	
Race/ethnicty									
White		referent			referent			referent	
African American	.83	.59	1.17	.79	.42	1.47	.83	.56	1.22
Hispanic	1.05	.78	1.40	1.06	.69	1.63	1.08	.76	1.54
Other	.67	.40	1.13	.72	.32	1.65	.65	.35	1.21
Education									
≥ Some college		referent			referent			referent	
≤ High school	.95	.77	1.17	1.11	.79	1.57	1.01	.80	1.27
Income									
≤ $25,000	.86	.65	1.13	.94	.57	1.55	.79	.60	1.03
$25,001 - $50,000		referent			referent			referent	
$50,001 - $75,000	.91	.67	1.23	.69	.41	1.17	1.16	.80	1.69
≥ $75,001	.97	.74	1.28	.96	.58	1.59	1.00	.73	1.37
Age	**1.08**	**1.01**	**1.15**	1.06	.95	1.18	1.08	.99	1.18
Perceived ambiguity									
Agree		referent			referent			referent	
Disagree	1.25	.93	1.67	.89	.51	1.55	**1.47**	**1.09**	**1.98**

Table 5. Multivariate analysis for accurate knowledge of recommendations.

	TOTAL			MALES			FEMALES		
	OR	**95% CI**		**OR**	**95% CI**		**OR**	**95% CI**	
		Upper	*Lower*		*Upper*	*Lower*		*Upper*	*Lower*
Gender									
Male		referent			------			------	
Female	**1.57**	**1.26**	**1.95**		------			------	
Age	1.01	1.00	1.02	1.01	1.00	1.00	1.01	1.00	1.02
Perceived ambiguity									
Agree		referent			referent			referent	
Disagree	1.20	.90	1.60	.87	.50	1.53	**1.47**	**1.08**	**2.01**

*Note: Statistically significant values are **bolded**.*

Table 6. Bivariate analyses for recommended physical activity level.

	TOTAL			MALES			FEMALES		
	OR	**95% CI**		**OR**	**95% CI**		**OR**	**95% CI**	
		Upper	*Lower*		*Upper*	*Lower*		*Upper*	*Lower*
Gender									
Male	**1.63**	**1.33**	**1.99**		------			------	
Female		referent			------			------	
Race/ethnicty									
White		referent			referent			referent	
African American	.83	.61	1.13	.92	.59	1.44	.80	.52	1.24
Hispanic	.79	.60	1.04	**.68**	**.47**	**.98**	.90	.63	1.28
Other	1.31	.84	2.05	1.30	.71	2.37	1.25	.77	2.03
Education									
≥ Some college		referent			referent			referent	
≤ High school	.89	.76	1.04	.94	.73	1.20	.85	.71	1.01
Income									
< $25,000	.89	.69	1.16	.70	.47	1.04	1.19	.88	1.59
$25,001 - $50,000		referent			referent			referent	
$50,001 - $75,000	1.13	.84	1.51	1.08	.76	1.54	1.16	.77	1.74
> $75,001	1.08	.80	1.47	1.01	.66	1.55	1.12	.85	1.48
Age	.99	.99	1.00	.99	.98	1.00	1.00	.99	1.01
Perceived ambiguity									
Agree		referent			referent			referent	
Disagree	1.07	.83	1.38	1.03	.69	1.54	1.19	.85	1.65
Knowledge									
Accurate	**1.46**	**1.24**	**1.73**	**1.63**	**1.29**	**2.05**	**1.48**	**1.17**	**1.87**
Not accurate		referent			referent			referent	

*Note: Statistically significant values are **bolded**.*

Table 7. Multivariate analysis for recommended *physical activity level.*

	TOTAL			MALES			FEMALES		
	OR	**95% CI**		**OR**	**95% CI**		**OR**	**95% CI**	
		Upper	*Lower*		*Upper*	*Lower*		*Upper*	*Lower*
Gender									
Male	**1.58**	**1.20**	**2.08**		------			------	
Female		referent			------			------	
Race/ethnicty									
White		referent			referent			referent	
African American	1.02	.61	1.70	1.10	.44	2.74	.97	.52	1.78
Hispanic	.70	.44	1.11	.52	.26	1.03	1.05	.61	1.78
Other	1.24	.64	2.40	1.57	.53	4.61	.97	.49	1.92
Perceived ambiguity									
Agree		referent			referent			referent	
Disagree	1.11	.86	1.42	1.01	.68	1.50	1.23	.92	1.65
Knowledge									
Accurate	**1.43**	**1.13**	**1.80**	**1.58**	**1.09**	**2.30**	1.28	.93	1.76
Not accurate		referent			referent			referent	
Accurate knowledge* perceived ambiguity	.98	.57	1.67	1.97	.89	4.37	.61	.32	1.14

Note: Statistically significant values are ***bolded****.*

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